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Marine Casualty Investigations

Enquêtes sur les accidents maritimes

Investigation Report to the Minister pursuant to sections 542 or 545 of the Canada Shipping Act

Rapport d'investigation au Ministre conformément aux articles 542 ou 545 de la Loi sur la marine marchande du Canada

Canada

Ce rapport est aussi disponible en français.

REPORT OF INVESTIGATION INTO THE CIRCUMSTANCES ATTENDING THE STRANDING OF FIVE BARGES ON WELSH ISLAND, WEST OF JOHNSTON ISLAND, LAKE ATHABASCA, SASKATCHEWAN, AUGUST 30, 1986, WHILE UNDER TOW OF THE TUG "W.H. HORTON".

REPORT No. 482

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REPORT OF INVESTIGATION INTO THE CIRCUMSTANCES ATTENDING THE STRANDING OF FIVE BARGES ON WELSH ISLAND, WEST OF JOHNSTON ISLAND, LAKE ATHABASCA, SASKATCHEWAN, AUGUST 30, 1986, WHILE UNDER TOW OF THE TUG "W.H. HORTON".

Particulars of Vessel

Name	"W.H. HORTON"
Official Number	344611
Port of Registry	Edmonton, Alberta
Call Sign	CZ 9720
Gross Tonnage	107
Net Tonnage	72.76
Length (Registered)	21.03 m
Breadth (Registered)	7.62 m
Depth (Registered)	1.64 m
Depth (Moulded)	2.40 m
Draught	0.91 m forward 0.99 m aft
Type	Shallow draught steel tug
Built	1970, Vito Steel Boat & Barge Construction Ltd., Delta, B.C. Assembled - Fort Providence N.W.T.
Propulsion	Four GM 8V-71 eight cylinder diesel engines driving four fixed-pitch propellers and capable of attaining a total of 920 BHP. The engines are controlled from the wheel-house.
Cargo	Towing five barges with a total of 559 tonnes of deck cargo and 152 tonnes of diesel fuel oil P-50.
Crew	Seven
Owners	Arctic Transportation Limited, Calgary, Alberta.

Charterer:	A.Frame Contracting Ltd. Fort McMurray, Alberta.

The "W.H. HORTON" was chartered by A. Frame Contracting Ltd., during the 1984 and 1985 navigation seasons and again in 1986 until they bought the vessel in October 1986.

Navigating Equipment

Radar	Decca, RM 316
Echo Sounder	Apelco, MS 254L, Sparker
VHF Radiotelephone	Raytheon, RAY 55
SSB/AM Radiotelephone	Motorola, Triton 40S
Radiotelephone	Metro Tel 84, Mobile Communications, Alberta Government Telephone (AGT) No XJ57837
Magnetic Compass	Sestrel
Searchlights (1) (2)	Xenon searchlight Incandescent searchlight

Lifesaving Equipment

Lifeboat (1)	Davidson, 4 person, fibreglass boat
Liferaft (1)	Beaufort inflatable, 10 person, Model "A" pack
Lifebuoys (4)	
Lifejackets (12)	

Description of Vessel

The "W.H. HORTON" is a shallow draught tug utilized primarily for pushing and towing barges within the Mackenzie River system. The tug is fitted with four propellers and six rudders and has a spoon bow and flush afterdeck. The vessel is of steel construction with an aluminum deck-house.

The wheel-house is well laid out and affords a 360° view. The wheel-house console is situated against the forward bulkhead beside the wheel-house windows and the steering wheel is situated amidships on the console. The console is fitted with a jog steering controller adjacent to the wheel and there is a second controller on the port bulkhead. The wheel-house is

equipped with direct propulsion controls within easy reach of the steering position. The vessel was not fitted with automatic pilot.

The "W.H. HORTON" has a hydraulic single-drum towing-winch with a drum capacity for 365 m (1200 ft) of 28.5 mm (1 1/8 in) wire rope. The winch is equipped with an air release abort valve which, when activated from the wheel-house console, allows the towing wire to spool free.

Particulars of Barges

Name	"RADIUM 350"	"RADIUM 351"
Official Number	195242	195243
Port of Registry	Vancouver	Vancouver
Type	Steel barge	Steel barge
Propulsion	None	None
Gross Tonnage	213.4	213.4
Registered Tonnage	213.4	213.4
Length (Registered)	36.57 m	36.57 m
Built	1952, Vancouver, B.C.	1952, Vancouver, B.C.
Number of Crew	Unmanned	Unmanned
Draught (Departing Fort McMurray)	1.09 m forward 1.04 m aft	0.86 m forward 0.71 m aft
Cargo	General and diesel oil	General and diesel oil
Name	"RADIUM 352"	"RADIUM 212" ex H.B.C. Barge No 212
Official Number	195244	175555
Port of Registry	Vancouver	Vancouver
Type	Steel barge	Steel barge
Propulsion	None	None

Gross Tonnage	213.4	295.8
Registered Tonnage	213.4	295.8
Length (Registered)	36.57 m	35.05 m
Built	1952, Vancouver, B.C.	1946, Trenton, Ontario
Number of Crew	Unmanned	Unmanned
Draught (Departing Fort McMurray)	1.01 m forward 1.01 m aft	0.81 m forward 0.81 m aft
Cargo	General and diesel oil	General cargo
Name	"RADIUM 427"	
Official Number	190810	
Port of Registry	Vancouver	
Type	Steel barge	
Propulsion	None	
Length (Registered)	36.57 m	
Gross Tonnage	220.8	
Registered Tonnage	220.8	
Built	1948, Vancouver, B.C.	
Number of Crew	Unmanned	
Draught (Departing Fort McMurray)	0.76 m forward 0.91 m aft	
Cargo	General cargo	
Owners (of all barges)	Northern Transportation Co. Ltd., Edmonton, Alberta	
Charterers	A. Frame Contracting Ltd., Fort McMurray, Alberta	

All five barges were steel flat top non-self-propelled coasting barges used to carry general cargo on deck and diesel oil

in bulk below decks, as necessary.

Note: All times in this report are expressed in Mountain Daylight Saving Time (UTC minus 6 hours)

Background

On the morning of August 30, 1986, the tug "W.H.HORTON" bound for Bushell on Lake Athabasca with five unmanned loaded barges in tow, experienced gale/storm force winds and heavy seas, setting the tug and tow towards Welsh Island near Johnston Island. Some of the braided nylon couplers, set between each barge and its succeeding barge, parted during the course of the morning, resulting in the tug losing considerable manoeuvrability to handle the tow and subsequently, four barges broke loose and stranded on Welsh island. The tow-line to the fifth barge was aborted in order to save the tug which was perilously close to the beach and this barge also stranded.

Four of the barges were later salvaged and towed to Fort McMurray for repairs but the fifth barge, could not be salvaged at the time and was intentionally sunk in a suitable position until after the 1987 spring thaw when it could be recovered and repaired. Damage to the barges was reported to be in excess of one million dollars and to the cargo, some $290,000.

There were no injuries as a result of this casualty. The barges and cargo suffered extensive damage and a large quantity of diesel oil was lost although no appreciable amount of pollution was observed in the area.

Narrative

Water levels in the Athabasca River rise shortly after spring break-up about May 2 and usually reach a maximum height in June or July, decreasing again through to the end of the navigation season near the end of October.

The rate of the current in the Athabasca River seldom exceeds 3 knots and flows towards Lake Athabasca. At turns in the river where the bottom is soft, deeper water is normally found on the outside of the turn, while the eddies along the inside curves allow silt to deposit thus forming shoal banks or spits which make towing operations difficult. Tugs such as the "W.H.HORTON", which operate with a deepest draft of only 0.99 m (3.25 ft), frequently run aground on these banks and often sustain rudder damage.

At 0630, August 23, 1986 the tug "W.H.HORTON"

commenced relaying loaded barges from Fort McMurray in the Clearwater River, to Le Mans tie up at Mile 8 on the Athabasca River. Due to low water levels, sand bars and sharp bends in this stretch of waterway, it is possible to push only one barge ahead of the tug. The procedure is therefore to push each loaded barge separately to Mile 8 where it is secured to trees on the river bank. When the required number of up to six barges have been delivered to Mile 8, they are secured together with the tug and pushed ahead as one composite unit with the barges no more than three abreast. The draught to which the barges are loaded depends on the existing water levels.

At 0700, August 23, shortly after departing from Fort McMurray, the "W.H.HORTON", pushing the barge "RADIUM 350" which was loaded to a deepest draught of 1.09 m (3.6 ft) ran aground on the first Clearwater River rock cut. The tug sustained damage to her steering gear tiller arms and returned to Fort McMurray for repairs. On completion of repairs by the vessel's engineers, the "W.H. HORTON" resumed relaying barges at 1330. By 2130 that same evening, barges "RADIUM 350", "RADIUM 351" and "RADIUM 427" were secured at Mile 8 and the "W.H.HORTON" had returned to Fort McMurray and secured for the night.

The barge relaying operation resumed at 0620, August 24 and barges "RADIUM 352" and "RADIUM 212" were secured at Mile 8 by 1115. The "W.H.HORTON" later departed from Fort McMurray with barge "RADIUM 434" and at 1440 both tug and barge ran aground, again on the first Clearwater River rock cut. The vessels remained aground until the following day when they were assisted clear by a local tug.

At 1400, August 25, the "W.H.HORTON" cleared the rock cut and proceeded on her voyage leaving the "RADIUM 434" secured at Fort McMurray for a later delivery. The "W.H.HORTON" departed from Mile 8 at 1630 that same day pushing the five unmanned barges ahead of her and at 2130 secured for the night at Mile 41.

The vessels were secured overnight August 25, 26 and 27 but continued on passage throughout the night of August 28 to make an early morning arrival at Fort Chipewyan, August 29.

The barges were loaded with approximately 559 tonnes of deck cargo consisting of stores, personal effects, aviation fuel and an assortment of other fuels in drums and a variety of cars and small trucks. In addition, barges "RADIUM 350", "RADIUM 212" and "RADIUM 352" each carried approximately 50 tonnes of bulk diesel oil P-50 in below deck tanks.

The general cargo was mainly palletized and carried in semi-trailers and there was a tractor to facilitate the off-loading. The cargo was destined for some 120 consignees and the scheduled ports of discharge were: Fort Chipewyan, Alberta and Bushell, Fond-du-Lac and Stoney Rapids in Saskatchewan. Barge service to those communities is approximately once every month during the navigation season and this load was to service some communities until spring: delivery by air freight is an expensive alternative.

All cargo handling operations for A. Frame Construction are carried out by a shore crew that travels by company plane in advance of the tug; this allows the tug crew to attend to yarding the barges.

Pushing operations resumed at 0730, August 27 and during the following days, the tug and tow ran aground a further four times and while in the vicinity of Mile 77.5, received assistance from the Coast Guard vessel "MISKANAW". In some areas the barges had to be taken across sand-bars one at a time.

As a result of the groundings, the steering gear tiller bar was slightly bent and the steering ram developed a slight leak at the seal. The steering gear was still functional however, and arrangements were made, by radiotelephone with the operator, to have a new seal flown to Bushell in time for the vessels' arrival. In the meantime, the engineers ensured that the steering gear header tank was kept full of hydraulic oil.

The "W.H.HORTON" and barges arrived in Fort Chipewyan at 0615, August 29 and the shore crew discharged some 73 tonnes of general cargo and unloaded the diesel fuel from "RADIUM 212".

At 1910, August 29, the "W.H.HORTON", with a crew of seven on board including the master, departed Fort Chipewyan government dock en route to Bushell with the barges carrying cargo destined for nearby Uranium City.

The deck department of the "W.H.HORTON" consisted of the master, mate and two deck-hands and whilst the vessel was underway, they kept a six-hour watchkeeping system with two persons to each watch.

The master and a deck-hand assumed the first watch on departing from Fort Chipewyan and once clear of the harbour they made up the tow astern of them. It consisted of 275 m (900 ft) of 28.5 mm (1 1/8 in) diameter towing wire led from the towing winch and shackled to a 13.7 m (45 ft) x 28.5 mm

(1 1/8 in) diameter towing bridle. The towing bridle had soft eyes at each end which were hooked onto the forward port and starboard towing bollards on the lead barge "RADIUM 427". Successive barges were joined one astern of the other by two 18.2 m (60 ft) lengths of 63.5 mm (2 1/2 in) diameter nylon braided couplers. The barges were joined in the following order from forward to aft: "RADIUM 427", "RADIUM 352", "RADIUM 212", "RADIUM 351" and "RADIUM 350".

On departing Fort Chipewyan, the wind was light westerly with slight sea conditions and it was decided to follow an easterly course to pass south of Bustard Island. At about 2130, the wind backed to the south and it was then decided to steer in a north-easterly direction following the more southerly route along Lake Athabasca to Bushell, as shown on CHS chart No.6310, in order to gain the lee of the land from south to south-easterly winds. It was not deemed necessary to call Fort Chipewyan radio station for a weather report.

The tug and tow, steaming at a speed of approximately 5 knots at 1700 r.p.m., and making good a course of about 053°T, passed abeam of Stone Point at approximately 2400 at which time the first mate relieved the watch. At 2400 the wind had veered to light westerly once more with seas remaining slight.

The 0000-0600 watch was uneventful and the "W.H.HORTON" passed Point Brule at 0220 and Point Ennuyeuse at 0450 by which time the wind had veered to the north-west and increased to 20 knots with slight/moderate seas.

The master assumed conduct of the vessel again at 0600, August 30, with the vessel, in a position approximately 4.7 miles SSW of Bear Tooth Island, still making good a direct course to Bushell and the engines turning 1700 r.p.m. Navigation was by radar distances off the land and the vessel, not being equipped with auto pilot, was being steered by hand using the wheel. Also, at 0600, the second engineer assumed the engine-room watch relieving the chief engineer.

At 0700 the wind was reported to be north-westerly 25 to 30 knots and the sea state deteriorating.

The routine on board the "W.H.HORTON" while underway and towing, was for the person in charge of the deck watch to attend to the steering and navigation while the deck-hand attended to routine duties and occasionally relieved at the wheel. There is very little traffic on Lake Athabasca especially towards the end of the navigation season and it is believed that the "W.H.HORTON" was the sole vessel on Lake

Athabasca at this time. On the morning of August 30, due to the deteriorating weather conditions, the deck-hand remained in the wheel-house.

Shortly before 0800 in an approximate position with Bear Tooth Island bearing 260°T, distance 5.5 miles, the "W.H.HORTON" altered course to make good a course of approximately North magnetic. This course was intended to keep the vessels well to the west of Crackingstone Peninsula in the event that the weather deteriorated still further, setting the tug and tow onto Johnston Island while making their approach to Black Bay.

At approximately 0830, August 30, the master was at the wheel steering the vessel when the rudders jammed hard-over to port. An attempt was made to bring the rudders back to amidships using the jog steering controller but to no avail and the chief engineer was summoned to attend to the problem. With the tug now swinging hard to port, the master attempted to control the vessel using the engines, however, she continued her swing assisted by the wind and he was forced to stop engines and take the engine out of gear as the tug ran over her own tow-line.

The engineers freed the steering gear by applying leverage to the jammed tiller bar and added some hydraulic oil to the header tank as a precautionary measure; it was difficult to tell if the tank was low and by how much, due to the tug rolling in the seas. The steering gear was then tested and found to be operational and with the exception of the previously noted damage incurred at the groundings, no other fault was found.

During the time the tug and tow were stopped and drifting, the barges bunched together in the moderate seas.

Also at 0830 the vessel's operator, who had landed at Uranium City with his shore crew, was concerned about the deteriorating weather conditions and called the "W.H.HORTON" by mobile telephone to inquire as to her progress. During the ensuing conversation, it was agreed to have the steering problem attended to in Bushell.

At 0845, reassured that the steering was functioning satisfactorily, the master of the "W.H.HORTON" continued on a course to pass about 10 miles west of Halifax Island and the engine was gradually worked up to speed turning about 1700 r.p.m.

When the "W.H.HORTON" was in approximate position 59°22'N, 109°21'W, it was noted that the barges were not

towing in a straight line and it was then observed that the starboard towing coupler had parted between "RADIUM 427" and "RADIUM 352", the first and second barges. The vessel was immediately reduced to half speed ahead. The wind at this time was reported to be north-westerly at 50 knots with seas of 3.0 to 3.7 m (10-12 ft) and both tug and barges were rolling heavily.

The "W.H. HORTON" continued at half speed attempting to make good a magnetic Northerly direction but due to the wind and heavy seas she could make no headway and was setting in an east-by-south direction towards Johnston Island.

When approximately 3.0 miles west of Johnston Island, a second coupler broke on the starboard side between barges "RADIUM 212" and "RADIUM 351". At this time it was contemplated navigating the vessel around the north end of Halifax Island and into Gunnar via St.Mary's Channel for shelter, however, the tug and tow continued to set in an easterly direction and the barges were askew making it impossible to increase speed without incurring further problems with the barges.

At about 1140, in an approximate position 1.5 miles west of Welsh Island, a third coupler broke on the starboard side between barges "RADIUM 351" and "RADIUM 350". In a last effort to save the tug and barges, speed was increased to full ahead. The wind was now gusting in excess of 50 knots and the waves had developed into rollers pushing the tug and tow sideways while the barges were hindering the vessel's progress still further. The first mate entered the wheel-house at this time to assist as necessary.

At 1155, August 30, 1986, with the tug and tow unable to make any headway in the storm, the last three barges of the tow grounded on the beach at the northern side of Welsh Island in position 59°20.0'N, 109°03.4'W. The "W.H.HORTON" continued to steam full ahead in an effort to save the two remaining barges however, the port side coupler between "RADIUM 427" and "RADIUM 352" also parted and "RADIUM 352" was swept ashore a short distance to the east of the first three barges. Soon after, the abort button was pressed in the wheel-house releasing "RADIUM 427" in order to prevent the tug, which was perilously close to the shore, from being swept onto the rocks. "RADIUM 427" was then swept ashore on Welsh Island.

The "W.H.HORTON" was then manoeuvred in the general area in an effort to assess the damage to the barges and cargo, however, at about 1230, the rudders jammed hard over to port once more and the vessel was anchored off the north-

western tip of Johnston Island. The engineers had the steering gear operational again at 1255 after which the anchor was weighed and the "W.H.HORTON" proceeded to shelter in Gunnar.

Moments after aborting "RADIUM 427", the operator of the "W.H.HORTON" called on the mobile telephone to inquire as to the vessel's progress and upon hearing the news of the stranded barges, immediately notified the Canadian Coast Guard, the Saskatchewan Department of Environment, Insurance underwriters and Northern Transportation from whom the barges were leased.

The operator and shore crew then gathered together all of the oil booms available in the Bushell area. However, no further action could be taken until early on the morning of August 31 when the weather subsided, at which time they flew over the area to make a cursory inspection of the damage. They later boarded the "W.H.HORTON" at Gunnar and arrived off Welsh Island at 0915.

Barges "RADIUM 352" and "RADIUM 427" were found to be heavily stranded on the rocky north-eastern face of the island and the other three barges were aground on rocks close to the shore on the north-western face. The majority of the cargo, trucks and semi-trailers remained attached to the grounded barges, however, most were displaced and some badly damaged. One semi-trailer had been thrown on to the rocks and had broken open with its cargo strewn along the shoreline.

No appreciable amount of oil pollution was evident, however, drums of petroleum products lay between the barges and the shoreline and the shore crew rigged an oil boom around "RADIUM 350", "RADIUM 351" and "RADIUM 212".

The "W.H.HORTON" departed from Welsh Island at 1845, August 31 and after a brief stop at Gunnar, proceeded to Tokyo Snye Channel in the Athabasca River where the unmanned and empty barges "RADIUM 210" and "RADIUM 105" were picked up to assist in the salvage operation. The tug and barges arrived off Welsh Island again at 0840, September 2 and the salvage and clean-up operation commenced. One of the two salvage barges was later fitted with three railcar tanks to facilitate the transfer of diesel oil from the stricken barges.

All barges were found to have extensive bottom and lower side shell damage. Salvage was accomplished by patching, sealing and air injection until the barges could be refloated and taken to a safe beach for further patching.

Approximately 80% of uncontaminated diesel oil was

reportedly recovered from "RADIUM 350" and only about 10% of contaminated diesel oil was recovered from "RADIUM 352". No large oil slick was found to account for the some 194,000 litres of diesel oil reported missing. On September 10, a Canadian Coast Guard helicopter searched a large area of Lake Athabasca but could find no evidence of pollution resulting from the strandings.

All barges with the exception of "RADIUM 427", were refloated by September 12 and delivered to Fort McMurray by the "W.H.HORTON" on October 20 for repairs.

"RADIUM 427" was not salvaged at the same time as the other barges due to inclement weather and the unavailability of air bags. The vessel was intentionally sunk and marked in 18.2 m (60 ft) of water, on a shelf with a silt bottom near Welsh island and away from the effects of ice until after the spring thaw. On July 2, 1987, preparations were in hand for raising "RADIUM 427".

On completion of the clean-up operation, the "W.H.HORTON" arrived at Fort McMurray at 1900, September 18, and departed again on September 25 with more cargo for the remote communities.

The Saskatchewan Department of Environment inspected the shoreline around Welsh Island and Johnston Island and reported the clean up as being to their satisfaction.

Analysis

1. Weather

The marine forecast for Lake Athabasca issued by Environment Canada at 1400, August 29, 1986 and valid for August 29 and 30 was as follows:

> Lake Athabasca
>
> Winds southeast 15 to 20 knots this evening shifting and becoming westerly 20 knots overnight and northwest 20 to 30 knots on Saturday. Frequent cloudy periods. Scattered showers and thundershowers lowering visibility at times to fair.
>
> Marine Synopsis for Lake Athabasca
> A trough of low pressure moving eastward from Alberta will cross the lake tonight. Southerly winds ahead of the trough will change to brisk northwesterlies behind it on Saturday. Showers

will develop as the trough approaches and will linger in its wake.

The marine forecast for Lake Athabasca issued by Environment Canada at 0700, August 30, 1986 and valid for August 30 with an outlook for August 31 was as follows:

> Winds westerly 10 knots becoming northwest 15 knots this morning and northwesterly 20 knots this afternoon. Winds diminishing to light northerly overnight. Occasional cloudy periods with chance of a shower today. A few clouds tonight. Outlook for Sunday...sunny with light winds.
>
> Marine Synopsis for Lake Athabasca
>
> A fairly intense low pressure system centered northeast of Great Slave Lake this morning will move eastward today to create a brisk northwesterly flow over Lake Athabasca by late this morning. The winds will become light overnight and Sunday as a high pressure area moves in over the district. Some cloudiness with possible showers are forecast for the marine area today with clearing tonight and sunny skies on Sunday.

At 2400, August 29 a low pressure system with a 991 millibar centre was located near the northeastern corner of Great Slave Lake, N.W.T. By 1800 August 30, the low pressure centre had moved to south of Baker Lake, N.W.T.

The weather observation stations on Lake Athabasca are: Fort Chipewyan, Alberta to the west; Stoney Rapids, Saskatchewan to the east; and Uranium City, Saskatchewan to the north. There is also a weather observation station at Fort Smith, N.W.T., which lies between Lake Athabasca and Great Slave Lake.

Stoney Rapids, Fort Chipewyan and Fort Smith are manned stations whereas Uranium City has been an automatic station since June 2, 1986 following the closing of the Eldorado Mines.

Winds at Fort Chipewyan on August 30, 1986 were reported to be westerly at 12 to 15 knots, gusting to 21 knots; maximum gusts of 21 knots were reported at 1500.

At Uranium City on August 30, winds were stronger and

reported to be generally westerly 15 to 20 knots with gusts of 25 to 30 knots occurring after 0900. Maximum gusts of 37 knots with a mean wind speed of 19 knots, were observed at 1400.

At Stoney Rapids that same day, winds veered from southwesterly to westerly at about 1100 increasing in speed from 6 knots in the early morning to 18 knots, gusting to 28 knots at 1200 and 38 knots at 1500.

At Fort Smith winds were reported to be generally westerly at 15 to 18 knots with gusts of 20 to 25 knots on August 30. Maximum gusts of 30 knots were reported at 1500.

It was also reported that on the morning of August 30, winds gusting to 50 knots were experienced at Hay River Coast Guard Station in the N.W.T., and sustained winds of 40 knots were experienced on Great Slave Lake with gusts of 55 knots.

No gale warnings were forecast for Lake Athabasca for the period August 29 to 30, however, near gale force winds were predicted and Environment Canada has determined that reports tend to indicate a cold frontal passage over the lake between 1300 and 1500 August 30. Skies were mostly cloudy on that day and although light showers were reported, no thunderstorms were observed.

The marine forecast for Lake Athabasca is issued by Environment Canada in Winnipeg, Manitoba.

2. **Routing and Weather**

CHS Chart No.6310, Lake Athabasca, shows the main shipping routes and recommended routes for prevailing seasons and winds. The recommended route from Fort Chipewyan to Bushell during the fall and with winds from west to north-west, is along the north shore of Lake Athabasca.

Environment Canada marine forecast issued at 1400, August 29, forecast winds becoming westerly 20 knots overnight and north-westerly 20 to 30 knots for August 30.

The "W.H.HORTON" departed from Fort Chipewyan at 1910, August 29 and did not call the Coast Guard Radio Station for a weather forecast. It was assumed on board the "W.H.HORTON" that since the wind was light southerly when south of Bustard Island, that the vessel should

follow the south shore route across Lake Athabasca. Had the vessel received the weather forecast issued by Environment Canada it would have indicated the north shore route to be the safest route to follow.

Environment Canada weather forecasts for the period August 29 to 30 indicated winds from 'fresh breeze' to near gale force over Lake Athabasca, however, winds gusting to 50 knots or more were not forecast and were believed to be associated with a cold front passing over the area.

The Department of Fisheries and Oceans publication 'Sailing Directions for Great Slave Lake and Mackenzie River', sixth edition, 1985, in the chapter relating to 'Meteorological Information" informs the mariner that coastal or open water areas have the most frequent strong winds whenever a weather system is moving through and gives as an example that over Great Slave Lake the resulting winds may be two to four times stronger over the water than those measured by coastal stations.

The above mentioned publication also informs the mariner that many settlements are located in sheltered areas and therefore wind measurements are seldom representative of the general wind flow.

3. <u>Coast Guard Radio Stations (CGRS)</u>

Fort Chipewyan Coast Guard Radio facilities were operated by Transport Canada Air Traffic Services on behalf of the Canadian Coast Guard through a memorandum of understanding since 1978 and during the 1986 navigation season. The Coast Guard facilities at Fort Chipewyan were later closed November 1, 1986 and Hay River CGRS now services marine communications for the Lake Athabasca area.

The Canadian Coast Guard Telecommunications and Electronics Directorate publication TP145E, 'Radio Aids to Navigation', Pacific, Volume 31, 1986, advertised marine forecast broadcasts for Lake Athabasca at 0805 and 1505 and also on request between the hours of 0745 and 1545. The same publication advertises that Hay River CGRS would issue the marine forecast on request with no time stipulation. (See Annex 6)

It was reported that between the hours of 1600 and 0800 the following day an independent body, contracted by the government, manned Fort Chipewyan Radio Station primarily to supply aviation weather and to record and

report weather at the station; they would however, read the current marine forecast verbatim upon request.

The 0805 weather broadcast was not monitored August 30 and nobody on board the "W.H.HORTON" requested a marine forecast from Fort Chipewyan nor from Hay River CGRS on August 29 or 30, 1986.

4. Traffic on Lake Athabasca

Since the closing of the Eldorado Mines in Uranium City, very few commercial vessels operate on Lake Athabasca and with the exception of the Canadian Coast Guard navaids tender "MISKANAW" and a Department of Public Works dredger, only A.Frame Contracting Limited and another construction company operate vessels on the lake on a regular basis.

5. Towing Couplers

Towing couplers used between barges were constructed of Nylon-Multi Filament Polypropylene (MFP) braided line and variously reported as being of 63.5 mm (2 1/2 in) and 50.8 mm (2 in) diameter.

The following tensile strengths apply to the couplers:

(a) 50.8 mm (2 in) diameter Nylon-MFP rope coupler:
Average tensile strength: 101,000 lbs
Minimum tensile strength: 89,924 lbs

(b) 63.5 mm (2 1/2 in) diameter Nylon-MFP rope coupler:
Average tensile strength 150,000 lbs
Minimum tensile strength 136,000 lbs

These tensile strengths are based on the manufacturer's standard test methods applied to new and unused rope. Rope strength can be expected to decrease with use and age.

The rope couplers in question were new at the beginning of the 1986 navigation season and were reported to be in excellent condition prior to the morning of August 30, 1986. It was further reported that inspection of the couplers after the casualty revealed cuts and chafing in the areas where they parted. The cuts and chafing were consistent with the type of damage which may have been sustained when the "W.H.HORTON" experienced steering gear trouble and the barges bunched together in moderate

sea conditions off Bear Tooth Island on the morning of August 30.

Although there are no official criteria governing the number and tonnage of barges a tug can safely tow, it is considered in this instance that the "W.H.HORTON" having 920 BHP was well within the limits of her capability to tow five barges, each of about 400 tons loaded displacement and that either the 50.8 mm (2 in) or the 63.5 (2 1/2 in) nylon braided couplers were of ample strength for the towing operation. The general consensus from various Canadian Towing Companies is that towing operations are based on experience taking into consideration the type of tow, the area and conditions.

The towing arrangement used by the "W.H.HORTON" utilizing 18.2 m (60 ft) long couplers is ideal for Lake Athabasca providing good weather forecasts are available and recommended routing is strictly adhered to. An alternative towing arrangement 'the pendant hook-up arrangement' is not considered suitable in the shallow waters of Lake Athabasca.

However it should be noted that after losing four barges, the tug found herself in a situation that she was not even able to handle the one remaining barge in tow in the weather being encountered.

6. Damage

Cargo

Amongst other damage sustained by the deck cargo due to heavy seas and the ultimate impact of the barges grounding, the cargo suffered an appreciable amount of water damage and some cargo was a total loss.

Approximately 194,000 litres of diesel oil P-50 were lost although no large oil slicks were sighted on Lake Athabasca. Only a light sheen on the water surface was sighted August 31 in the vicinity of the barges and a subsequent search by a Canadian Coast Guard helicopter, September 10, revealed no pollution in the area.

The clean up of the beaches in the area was completed to the satisfaction of the Saskatchewan Department of Environment.

Barges

All barges sustained extensive bottom and lower side

shell damage. Plating was holed, torn and heavily set up between 30 cm and 46 cm in some areas with compartments breached on most barges.

On July 2, 1987 preparations were in hand for raising "RADIUM 427" using air bags.

"W.H.HORTON"

No damage was sustained by the "W.H.HORTON" as a result of the strandings.

The vessel returned to Gunnar to effect repairs to the damage previously sustained in the Athabasca River and to determine the cause of the rudders jamming in the hard-a-port position.

An inspection of the steering gear was carried out by the vessel's operator and crew and this revealed that a bend sustained in the tiller bar due to groundings in the Athabasca River, caused the tiller to become wedged against the steering ram main cylinder only when in a hard-a-port position.

When the steering gear jammed hard over to port during the voyage, the engineers unwedged it by applying leverage to the tiller bar.

7. Water Levels on Lake Athabasca & the Athabasca River.

It was reported that water levels in the Athabasca River had fallen considerably in the week prior to the "W.H.HORTON" commencing her operation, August 23, and that just prior to that time, barges were loaded to draughts of 1.22 m (4 ft).

Sailing directions for the area, caution that a strong westerly wind can cause the water level at the shallow west end of Lake Athabasca to drop 0.6 m (2 ft) or more. Conversely, a strong easterly wind will raise the water level by the same amount.

Several cautions are noted in the sailing directions warning mariners of possible daily or even hourly fluctuations in the water levels due to wind direction and velocity. There are two Federally maintained tide reading gauges; one each at Fort Chipewyan and Bustard Island. They are not available for immediate interrogation but are available for after the fact reference.

8. Mechanical Equipment

It was reported that all four main engines and the steering gear were operating in a satisfactory manner on departing from Fort McMurray at 0620, August 24, 1986; any subsequent problems with the steering gear were attributed to groundings after that time.

9. Certification of Vessels

The "W.H. HORTON" was certificated by the Ship Safety Branch of the Canadian Coast Guard as a Minor Waters Class II vessel to operate on Lake Athabasca and tributaries; she was operating with an SIC 21 Certificate issued at Vancouver, B.C., May 25, 1986 and valid until May 16, 1987. Her last periodic inspection was carried out at Fort McMurray, Alberta, May 25, 1986 and the vessel's inspection certificate was short termed pending her underwater inspection which was due to be carried out in May 1986. This fact however, is not considered to have any bearing on the casualty.

The five barges were built between 1946 and 1952 as unmanned, non-self-propelled vessels and are not therefore, subject to the requirements of the Hull Inspection Regulations (See Annex 1).

As the "W.H. Horton" was limited to minor Waters Class II as defined under section 6 paragraph (2) of the Home Trade, Inland and Minor waters Voyages Regulations (See Annex 2), the Load Line Regulations (Inland), the Load Line Rules for Lakes and Rivers, and the Interim Standard for the Intact Stability of Unmanned Cargo Barges (STAB 8) (See Annexes 3, 4 & 5), were not applicable to the barges.

10. Navigation Appliances

The navigation appliances on the "W.H.HORTON" operated in a satisfactory manner throughout the voyage. The vessel was being navigated by radar distances off the land, however, no positions were being plotted on the chart.

All radiotelephone communications were carried out by Metro Tel 84, Mobile Communications.

11. Survival/Distress Equipment

The vessel complied fully with the appropriate regulations for a Minor Waters Class II vessel as to the

amount and type of approved equipment.

Although the barges became stranded, the "W.H.HORTON" was not in a distress situation and her last barge was aborted to prevent the tug similarly stranding.

Communication between the wheel-house and engine-room on board the "W.H.HORTON" is by bell signals and by engine/wheel-house controls as there is no sound-powered telephone.

12. Certification and Experience of Crew

The master of the "W.H.HORTON" holds a Minor Waters Tug Boat Master's Certificate of Competency issued at Vancouver, B.C., 1949. He commenced seagoing on tug boats in 1935 and sailed as master since 1949. He later retired in 1984 and joined the "W.H.HORTON", August 23, 1986 in a relieving capacity after previously relieving on the vessel for one month during 1984.

The deck-hand on watch with the master does not hold a Certificate of Competency nor is he required to do so. He first joined the "W.H.HORTON" in 1984.

The mate holds a Master Minor Waters Certificate of Competency issued at Vancouver, June 6, 1983; he sailed on tugs and freighters for 25 years on Lake Winnipeg and joined the "W.H.HORTON", July 9, 1986.

Both engineers on board the "W.H.HORTON" held Certificates of Competency as Chief Engineer and 4th Engineer, respectively.

Findings

Five unmanned barges loaded with general cargo and some with bulk diesel oil, stranded on Welsh Island, Lake Athabasca while under tow of the Canadian tug "W.H.HORTON" during north-westerly gale/storm force winds and rough seas, causing extensive damage to barges and cargo.

It would appear that the following factors contributed to the strandings:

- the tug and tow arrangements were not intended for adverse weather conditions;

- the tug sailed without monitoring a scheduled weather broadcast, and therefore was not aware of impending adverse weather conditions;

- the tug sailed with her steering gear in a damaged condition due to previous groundings;

- the operational route for the tug and tow is in a difficult region for navigation due to it being an area of shallow water with ever changing water depths;

- because the weather forecast was not monitored, the tug and tow chose to follow what became the exposed southern route rather than the eventual sheltered northern route;

- the resumption of the voyage with a damaged steering gear was practical and acceptable for good weather conditions but should not have been undertaken against an adverse weather forecast;

- wind speeds experienced on Lake Athabasca during August 30 were gale force although only near gale force winds had been forecast;

- during the adverse weather conditions, the damaged steering gear on the tug jammed forcing the tug and tow to stop and the barges to 'bunch-up'. During this process, the barge towing bridles became impacted between the barges and were damaged;

- the damage to the nylon towing bridles contributed to their failure under adverse weather conditions and, thus, to the grounding of four of the barges; and

- the fifth barge was released, and she subsequently grounded, as a correct judgemental decision to save the tug on a lee shore in adverse weather conditions.

Other Findings

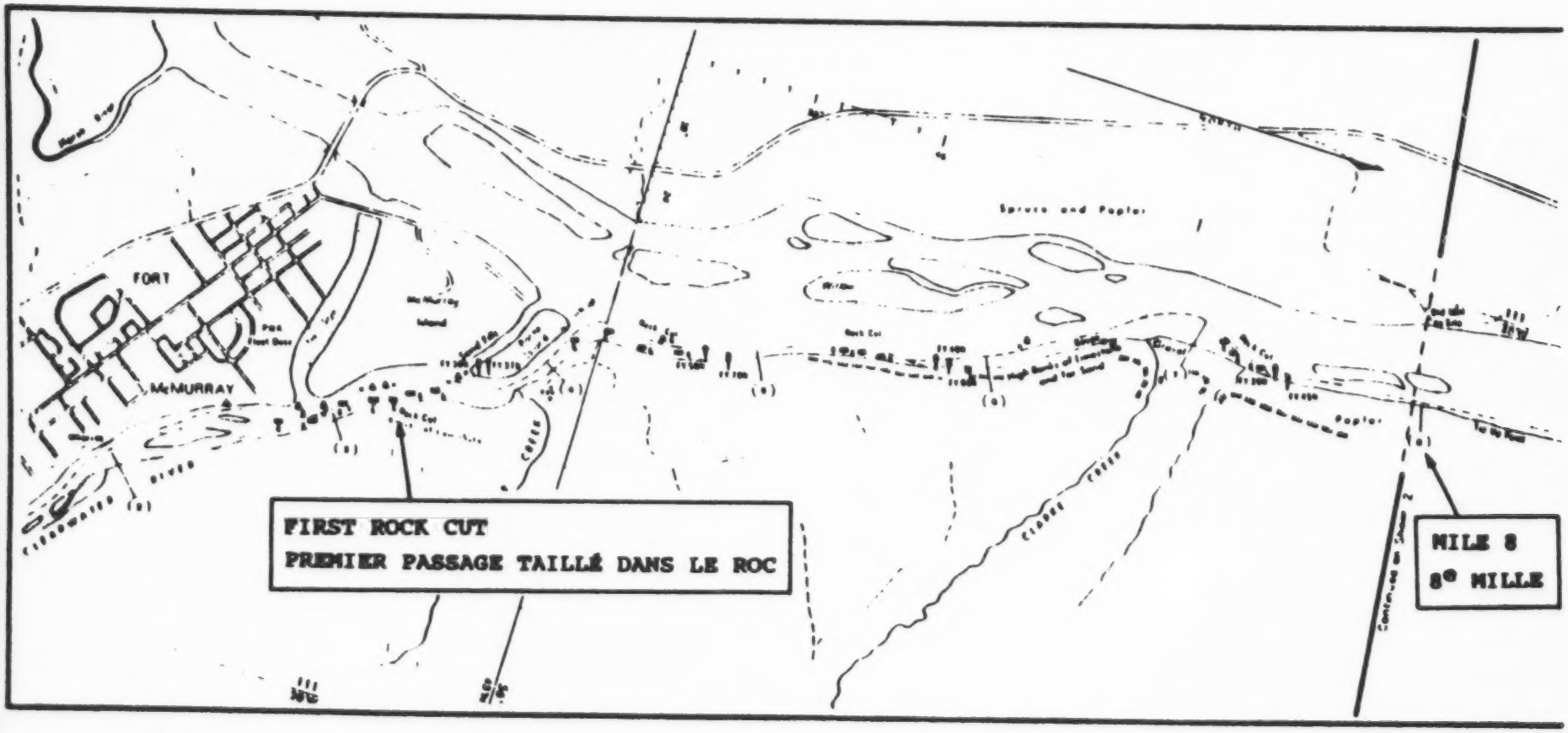
The plan of action implemented to contain the oil, was prompt and effective, although much of the oil dispersed and could not be recovered.

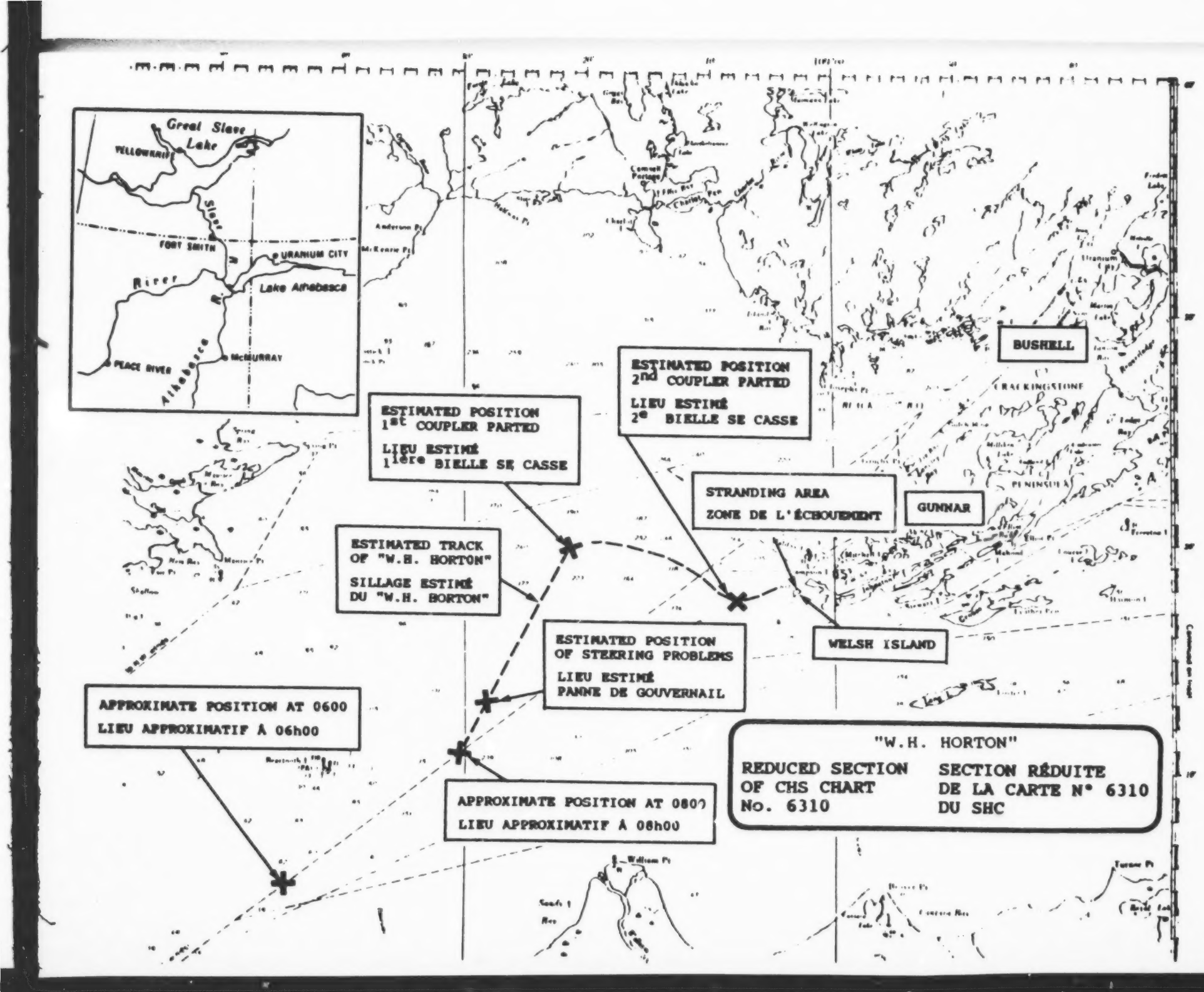
OTTAWA, ONTARIO
AUGUST 1987.

"W.H. HORTON"

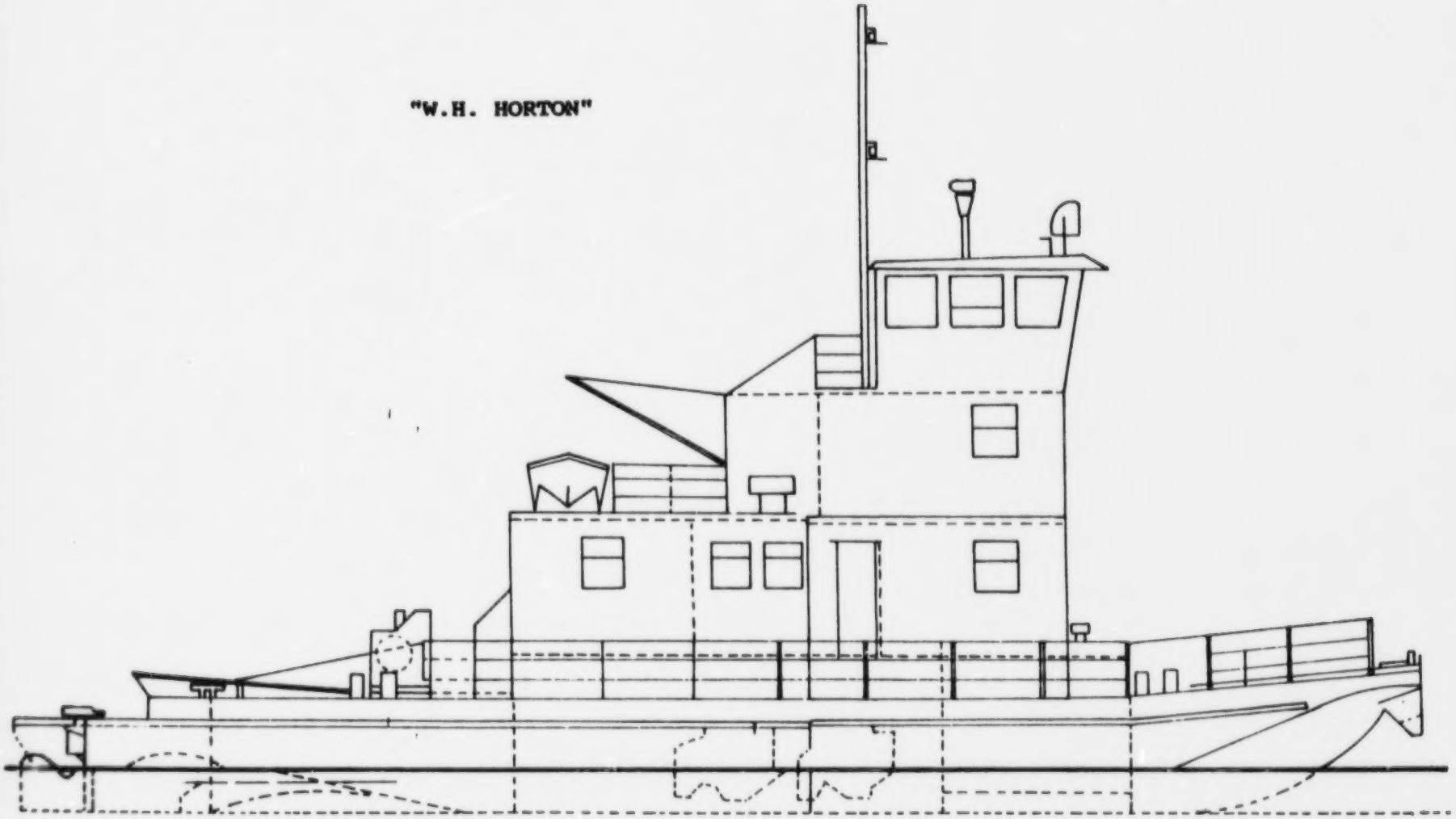
REDUCED SECTION OF SHEET No. 1 OF CHS CHART No. 6301	SECTION RÉDUITE DE L'ESQUISSE N° 1 DE LA CARTE N° 6301 DU SHC

ATHABASCA RIVER FORT McMURRAY MILE 2 TO MILE 8	RIVIÈRE ATHABASCA FORT McMURRAY MILLE 2 AU MILLE 8




Great Slave Lake
YELLOWKNIFE
Slave River
FORT SMITH
URANIUM CITY
Lake Athabasca
PEACE RIVER
McMURRAY
Athabasca
ESTIMATED POSITION 1st COUPLER PARTED
LIEU ESTIMÉ 1ière BIELLE SE CASSE
ESTIMATED POSITION 2nd COUPLER PARTED
LIEU ESTIMÉ 2e BIELLE SE CASSE
STRANDING AREA
ZONE DE L'ÉCHOUEMENT
BUSHELL
GUNNAR
ESTIMATED TRACK OF "W.H. HORTON"
SILLAGE ESTIMÉ DU "W.H. BORTON"
ESTIMATED POSITION OF STEERING PROBLEMS
LIEU ESTIMÉ PANNE DE GOUVERNAIL
WELSH ISLAND
APPROXIMATE POSITION AT 0600
LIEU APPROXIMATIF À 06h00
APPROXIMATE POSITION AT 0800
LIEU APPROXIMATIF À 08h00
"W.H. HORTON"
REDUCED SECTION OF CHS CHART No. 6310
SECTION RÉDUITE DE LA CARTE N° 6310 DU SHC

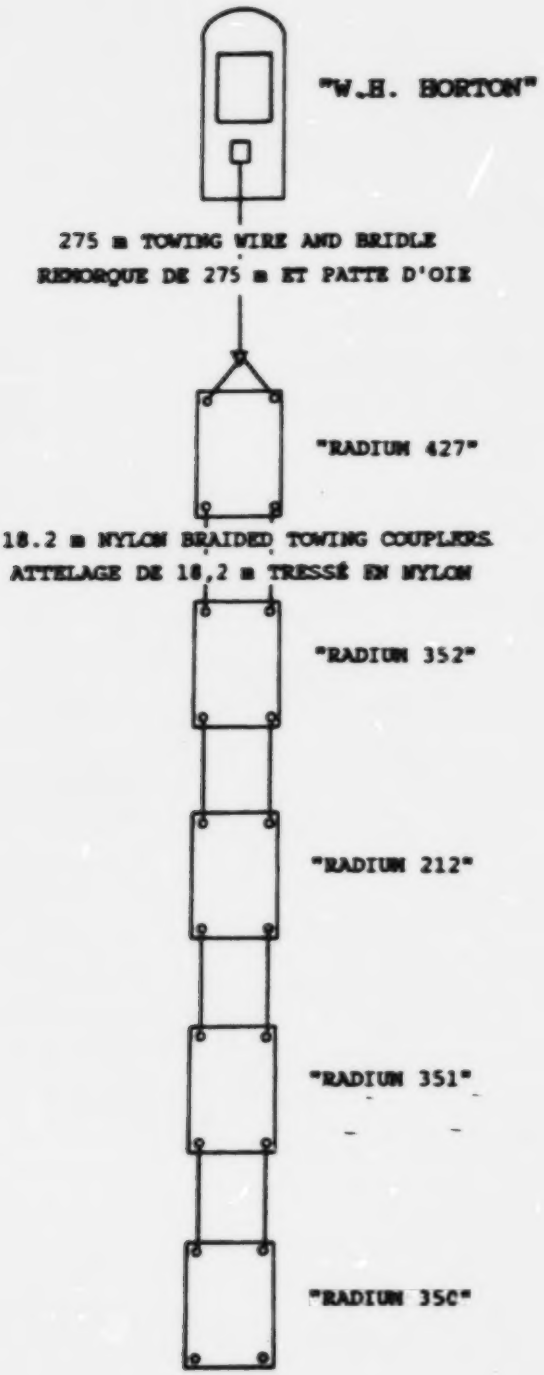
"W.H. HORTON"



PROFILE COUPLE LONGITUDINALE

"W.H. HORTON"

TOWING ARRANGEMENT DISPOSITION DU REMORQUAGE



NOT TO SCALE PAS DRESSÉ À L'ÉCHELLE

ANNEX 1

CANADA SHIPPING ACT

Hull Inspection Regulations

REGULATIONS RESPECTING THE INSPECTION OF HULLS AND EQUIPMENT OF STEAMSHIPS

Short Title

1. These Regulations may be cited as the *Hull Inspection Regulations*.

Application

3. (1) Subject to subsections (2) and (3), these Regulations apply to

(*a*) ships not over 5 tons, gross tonnage, that carry more than 12 passengers;

(*b*) passenger ships over 5 tons, gross tonnage;

(*c*) non-passenger ships over 15 tons, gross tonnage, including lighters, dredges, barges, hoppers and like vessels that are self-propelled; and

(*d*) non-self-propelled dredges, rock drills, floating elevators, floating pile drivers and like vessels that are subject to inspection.

ANNEX 2

CANADA SHIPPING ACT

Home-Trade, Inland and Minor Waters Voyages Regulations

REGULATIONS RESPECTING THE CLASSIFICATION OF HOME-TRADE, INLAND AND MINOR WATERS VOYAGES

Short Title

1. These Regulations may be cited as the *Home-Trade, Inland and Minor Waters Voyages Regulations*.

Minor Waters Voyages

6. (1) A minor waters voyage, Class I, means a minor waters voyage in the course of which a steamship goes anywhere within the limits of a minor waters voyage as defined in the *Canada Shipping Act*.

(2) Subject to section 7, a minor waters voyage, Class II, means a minor waters voyage made in certain lakes or rivers that are specified in the inspection certificate, and the greatest width of which does not exceed 2 miles, or a voyage in the course of which a steamship does not go beyond the limits of certain sheltered waters specified in the inspection certificate, or on short voyages so specified, beyond the limits of such lakes, rivers or waters, in fine weather, between May 1st and September 30th in any year, provided that, where a voyage is made in any lake or river that has a width in excess of 2 miles for a short distance only and it appears to the Board to be unreasonable to have such a voyage classed as a minor waters voyage, Class I, the Board may, in its discretion, class that voyage as a minor waters voyage, Class II.

Board to Decide Class

7. The Board shall decide, from time to time, having regard to the degree of risk that may be encountered, whether any voyage herein defined as a home-trade voyage, Class III, home-trade voyage, Class IV, inland voyage, Class II, or minor waters voyage, Class II, is a voyage of the next higher class, as herein defined.

ANNEX 3

CANADA SHIPPING ACT

Load Line Regulations (Inland)

REGULATIONS RESPECTING LOAD LINES FOR INLAND WATERS SHIPS

Short Title

1. These Regulations may be cited as the *Load Line Regulations (Inland)*.

Application

(2) These Regulations do not apply to

(*a*) a ship of war, a fishing vessel or a pleasure yacht;

(*b*) a ship that is

(i) marked with the load line marks described in the *Load Line Regulations (Sea)* or the *General Load Line Rules*, and

(ii) assigned freeboards in accordance with the *Load Line Regulations (Sea)*, the *General Load Line Rules* or equivalent regulations made in a country that is a party to the *International Convention on Load Lines 1966*, or the *International Load Line Convention, 1930*;

(*c*) a ship making a voyage that is

(i) a minor waters voyage, Class II, or

(ii) a voyage on any lake, the open waters of which do not exceed 25 nautical miles in length and 5 nautical miles in breadth; or

(*d*) a ship making a voyage from a place in Canada to another place in Canada that

(i) does not carry passengers or cargo, or

(ii) is not self-propelled and does not carry passengers or crew or carry oil as cargo.

ANNEX 4

CANADA SHIPPING ACT

Load Line Rules for Lakes and Rivers

RULES RESPECTING LOAD LINES FOR SHIPS MAKING VOYAGES ON LAKES OR RIVERS

Short Title

1. These Rules may be cited as the *Load Line Rules for Lakes and Rivers*.

(2) These Rules do not apply to

(*a*) a ship of war, a fishing vessel or a pleasure yacht;

(*b*) a ship in respect of which a request is made, by or on behalf of the owner, for the application to that ship of the *Load Line Regulations (Inland)*;

(*c*) a ship that is

(i) marked with the load line marks described in the *Load Line Regulations (Sea)* or the *General Load Line Rules*, and

(ii) assigned freeboards in accordance with the *Load Line Regulations (Sea)*, the *General Load Line Rules*, or equivalent regulations made under the laws of a country that is a party to the 1966 Convention or the 1930 Convention;

(*d*) a ship making

(i) a minor waters voyage, Class II, or

(ii) a voyage on any lake the open waters of which do not exceed 25 nautical miles in length and 5 nautical miles in breadth; or

(*e*) a ship without means of self-propulsion that is making a voyage from a place in Canada to another place in Canada and that does not carry passengers or crew.

ANNEX 5

STANDARD: STAB 8

INTERIM STANDARD FOR THE INTACT STABILITY OF UNMANNED CARGO BARGES

1 The provisions of this standard are applicable to unmanned cargo barges that:

(i) are required by standard LOAD 2 to be assigned load lines; and

(ii) are constructed after 1 September 1977.

STANDARD: LOAD 2

LOAD LINE REQUIREMENTS FOR UNMANNED BARGES

1(i) The following are guidance notes on which unmanned barges require or do not require load lines.

(ii) "New unmanned barge" means any unmanned barge required to be surveyed under, or any "existing unmanned barge" whose Owner chooses to have the survey done under, the Load Line Regulations (Sea) or (Inland).

4 Existing unmanned barges, on Ocean Service; 150 gross tons and over:

(i) domestic voyages (Canada to Canada):

(a) oil cargo - load line is not required.
(b) non-oil cargo - load line is not required.

(ii) international voyages (Canada to any other country):

(a) oil cargo - load line is required. See Note A.
(b) non-oil cargo - load line is required. See Note A.

5 Existing unmanned barges, on Inland Service; 150 gross tons and over:

(i) domestic voyages (Canada to Canada):

(a) oil cargo - load line is not required.
(b) non-oil cargo - load line is not required.

ANNEX 6

PART IV
ATHABASCA - MACKENZIE WATERSHED AREA
STATIONS PROVIDING COMMUNICATIONS & SPECIAL SERVICES
CONTINUOUS DURING NAVIGATION SEASON EXCEPT WHERE NOTED
5803 kHz Mackenzie River Watershed Emergency Frequency

1 Station Name Coordinates Call Sign	2 Class of Service	3 Intl. VHF Channel Numbers	4 Frequencies Transmitting	5 Frequencies Receiving	6 Broadcast Time MDT & Content	7 Remarks
FORT CHIPEWYAN, ALTA. 58 46 N 111 07 W VFF7	SS		5803J3E	5803		Marine forecasts available on request. Hours of service 0745-1545 MDT. Commence May 1.
	BC		5803J3E		0805,1505 (a)&(b)	(a) Marine forecasts for Lake Athabasca Region. Commence April 15. (b) Notices to Shipping.
FORT SIMPSON, N.W.T. 61 45 N 121 14 W VFF6	SS		5803J3E	5803		Marine forecasts available on request.
MAY RIVER, N.W.T. 60 50 N 115 47 W VFH3	SS		5803J3E	5803		Marine forecasts available on request.
	BC		5803J3E		0730,1930 (a),(b)&(c)	

USE OF 5803 kHz

The frequency of 5803 kHz is the area distress and calling frequency for the Athabasca - Mackenzie inland waterways. This frequency must be carried on all commercial vessels and will be monitored at all times when the vessel is in active operation on the waterways.

This frequency will not be used for any type of communication other than distress, urgency and safety communications and for the purpose of establishing initial radio contact with another vessel or shore station. After initial contact is made, for other than distress or emergency communication, the vessel and/or shore station involved will immediately transfer to an established working frequency.

For the provision of relay or assistance in communication to a land station or other vessel, the Department of Transport will provide, during the shipping season, 24 hour receive and transmit facilities on 5803 kHz.

DISTRESS, URGENCY, SAFETY

Procedures to be followed when involved with distress, urgency or safety communications are contained in PART V, GENERAL.

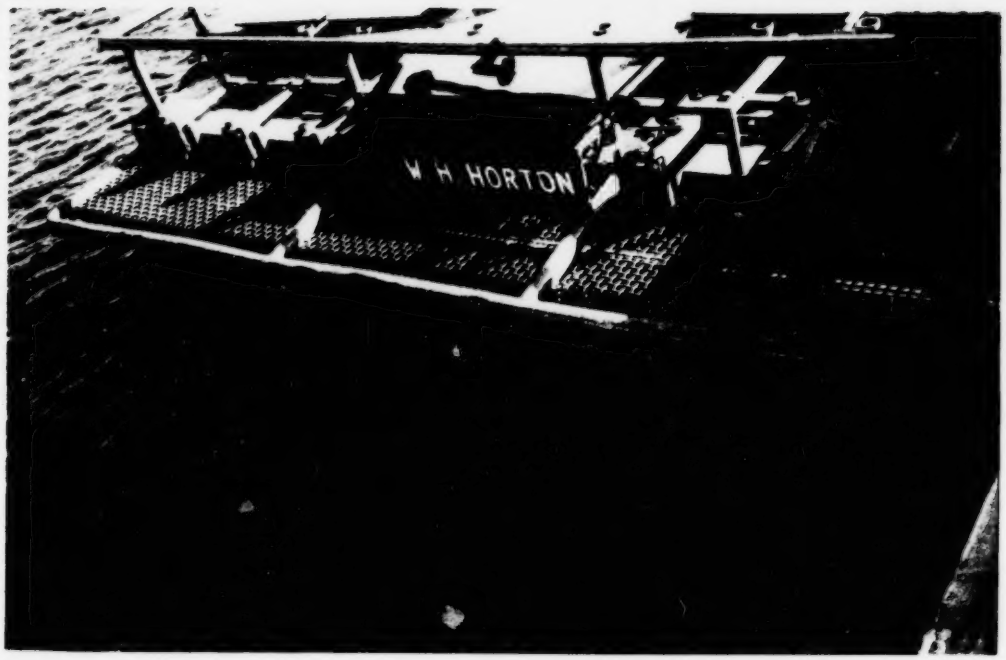
WEATHER BROADCASTS AND NOTSHIPS

For the benefit of all mariners operating on these waters, Marine Area Weather Forecasts will be broadcast on regular schedules by assigned Department of Transport stations on 5803 kHz. NOTSHIPS will also be broadcast, immediately following the scheduled forecast broadcasts. The District Manager, May River will control and assign NOTSHIPS for broadcast only in the particular area of interest. NOTSHIPS broadcasts are followed by Mackenzie Stage forecast at assigned stations.

"W.H. HORTON"

Wheel-house
Timonerie

"W.H. HORTON"



① Tiller arm was welded back on.
La barre franche fut soudée en place.

② Tiller arm cap was split, welded.
La cervelle était fissurée, soudée.

③ Damaged rudder blade replaced.
Le safran fut remplacé.

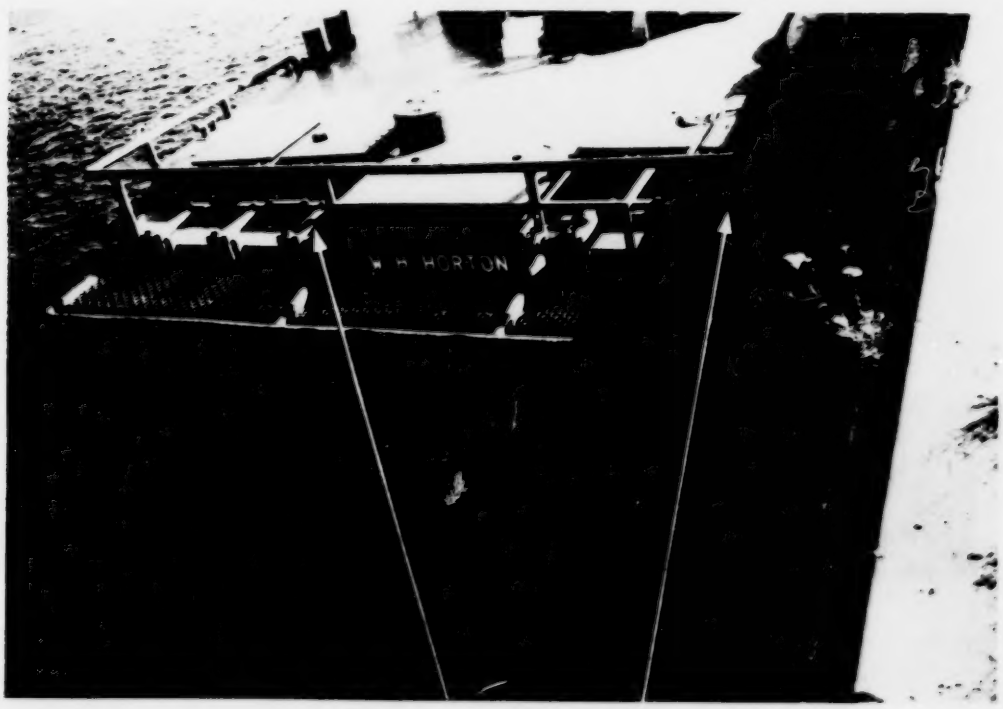
④ Bar was bent when port rudders hit river bank.
Le barreau fut gauchi quand les gouvernails bâbord ont heurté contre la berge.

Towing winch cable was used to pull bar straight at Old Gunnar Mines, Sask.

On a utilisé la remorque du treuil pour redresser le barreau à Old Gunnar Mines, Sask.

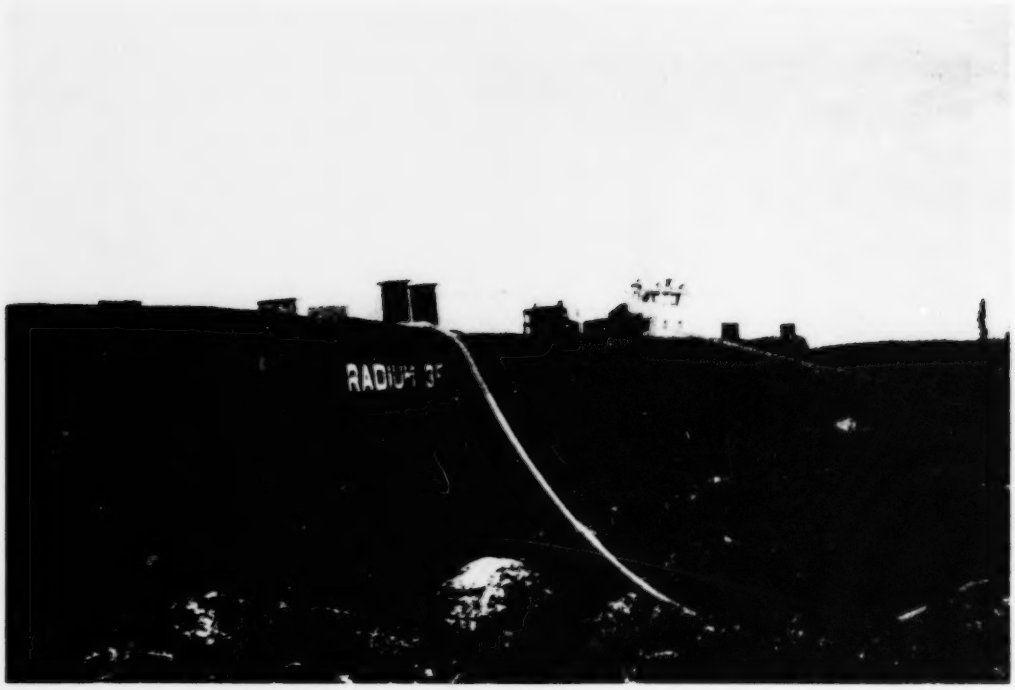
"W.H. HORTON"

Towing winch, wire and bridle
Treuil, remorque et patte d'oie.



Tiller arms and bar.
Barres franches et barreau.

"W.H. HORTON"



"Radium 352" and "Radium 427"
stranded on Welsh Island.

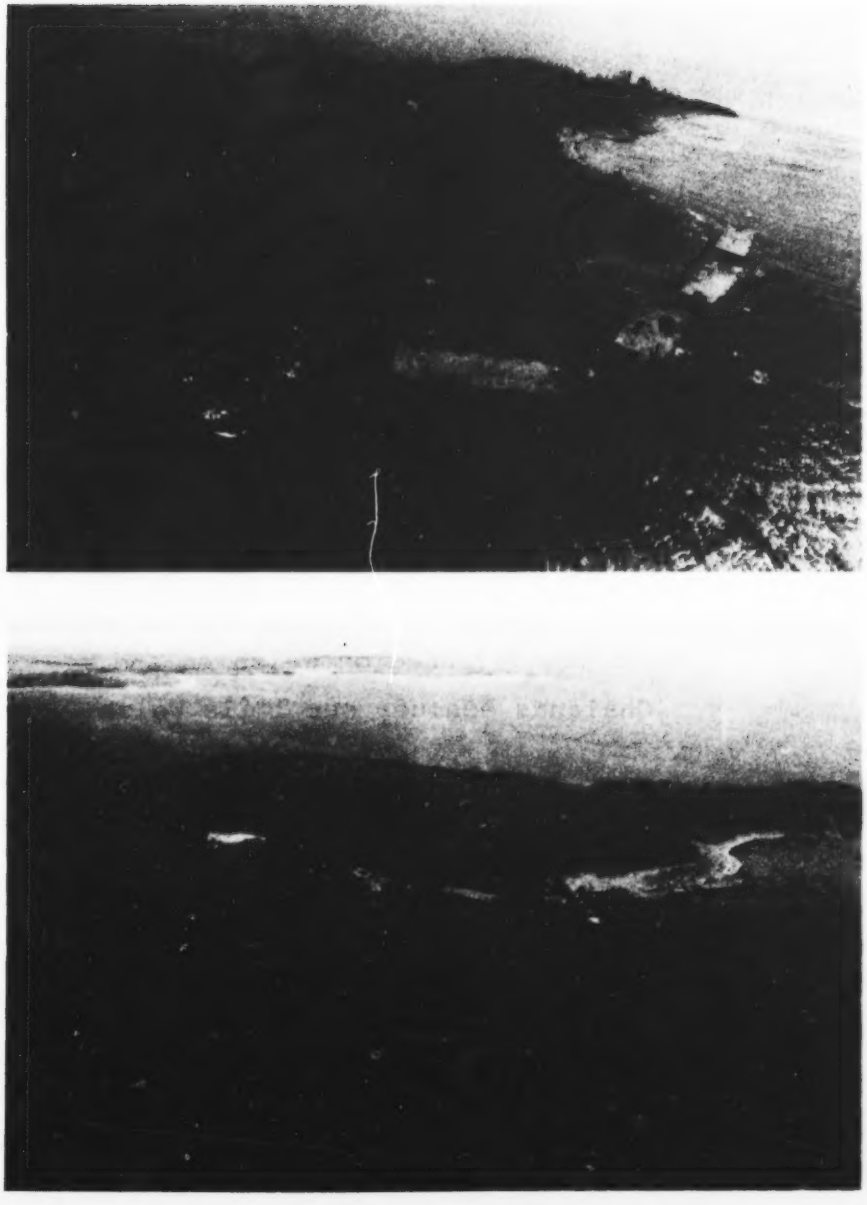
Le "Radium 352" et le "RADIUM 427"
échoués sur l'île Welsh.

"W.H. HORTON"

Barges stranded on Welsh Island.

Chalands échoués sur l'île Welsh.

"W.H. HORTON"

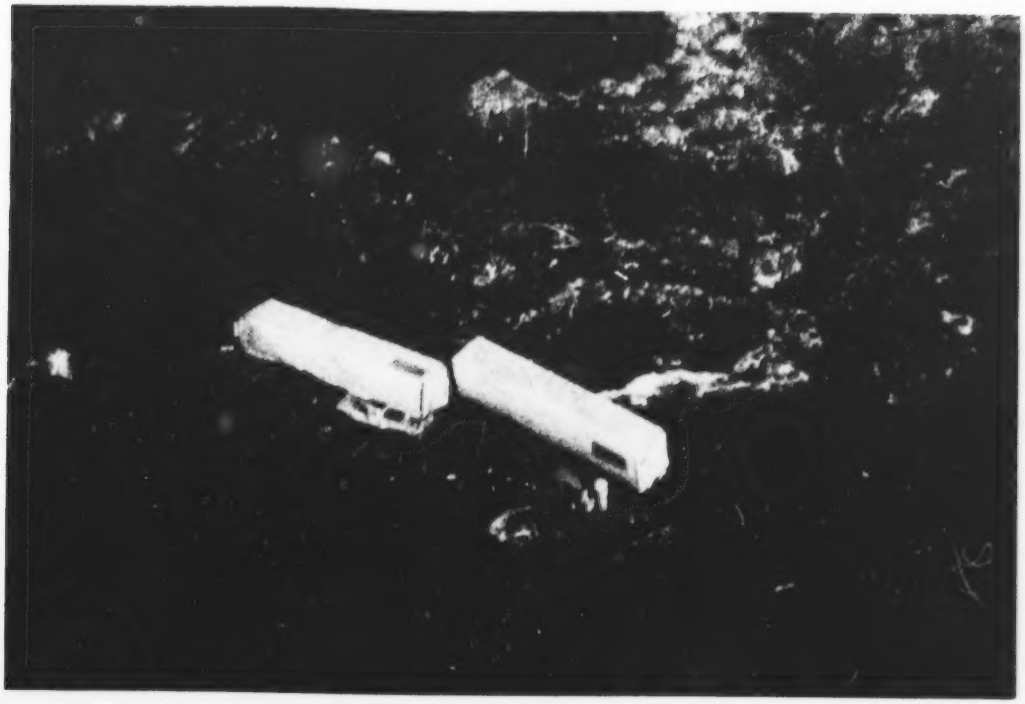


Barges stranded on Welsh Island.

Chalands échoués sur l'île Welsh.

"W.H. HORTON"

Debris on Welsh Island.
Débris sur l'île Welsh.



Barge stranded on Welsh Island.
Chaland échoué sur l'île Welsh.